My Expectations on Geometric Algebra (Innovative Teaching of Mathematics with Geometric Algebra)

AUTHOR(S):

Sato, Shigeru

CITATION:

Sato, Shigeru. My Expectations on Geometric Algebra (Innovative Teaching of Mathematics with Geometric Algebra). 数理解析研究所講究録 2004, 1378: 87-88

ISSUE DATE:

2004-05

URL:

http://hdl.handle.net/2433/25648

数理解析研究所講究録 1378 巻 2004 年 87-88

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Shigeru Sato
Schlumberger K.K.

I have been working for an oil well logging company as an engineer to develop measurement systems in oil wells. The underground exploration is made through compilation of various types of measurements based on physical and chemical principles. Almost all of such measurements belong to typical inversion problems.

Eight years ago, I came across Geometric Algebra (GA) when we engaged in a project, where we had to develop an algorithm to describe rotations of a measurement equipment in the oil well. Surveying mathematical techniques from use of Eulerian angle to Quaternions, we came to know Professor Hestenes' books, "New Foundation of Classical Mechanics" and "Clifford Algebra to Geometric Calculus". Since his another book, "Space-Time Algebra", was out of print, I asked him via e-mail about a plan of reprint. He did not know it but instead he told me his website, "Geometric Calculus, Research and Development".

Knowing GA, I have been fascinated with its uniqueness and universality. It may be able to solve many problems we have now in the oil well logging or at least to considerably relax constraints in many cases. Especially I expect applications to some geophysical problems.

Since then, I sometimes try to look for any information in the internet and publications. Year by year, the number of related websites has been increasing in the world but only a few websites[1)] are found in Japan. It seems strange for me that I have mostly seen reports of GA book purchase by university libraries.

I wonder why GA has not yet achieved its visibility in Japan and how we can improve it. I think that a reason may be in the fact that GA has not yet demonstrated its power and potential sufficiently to Japanese academic societies.

To make GA acknowledged well, it is the best to show a new finding or theory that only GA can make. Or it may be good enough that GA can give an elementary explanation to some already existing but very difficult theories to understand intuitively. A good candidate is Pauli's Spin-Statistics theorem[2]. Since Pauli published the paper in 1940, many people have made efforts to do it,[3] but no one have so far succeeded in it. Such a group includes Richard Feynman. He said, " ...This probably means that we do not have a complete understanding of the fundamental principle involved....".[4] I believe that this is the most adequate subject that GA challenges because of GA's history: professor Hestenes' recognition of GA was given on Dirac's spinor.

I could also expect that some elementary review articles in popular scientific magazines and books play an important role in illumining the public. In the history of GA development, we can see many interesting episodes about Hamilton, Grassmann, Clifford, Hestenes, and maybe Gibbs. The articles or books would be intellectually exciting and fully of "sense of wonder".

Reference

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